



8th Grade - Animals and the Electromagnetic Spectrum

Teacher Guide

Goal: Students will identify how animals react to heat (infrared radiation) throughout the Zoo.

GSE Connections: S8P4: Obtain, evaluate, and communicate information to support the claim that electromagnetic (light) waves behave differently than mechanical (sound) waves.

NGSS Connection: MS-PS4-2.: Develop and use a model to describe that waves are reflected, absorbed or transmitted through various materials.

Background Information: One way that we can talk about energy is in the form of heat, also known as infrared radiation. Infrared radiation travels in waves and is part of something known as the electromagnetic spectrum.

The electromagnetic spectrum is all of the electromagnetic radiation in the universe. Electromagnetic radiation travels in waves of varying lengths (wavelengths) and various frequencies (the number of waves per given unit). The types of electromagnetic radiation, arranged from highest frequency and shortest wavelength to lowest frequency and longest wavelength, are: gamma rays, X-rays, ultraviolet waves, visible light, infrared waves, microwave waves, and radio waves. Although almost all of the waves are present in our daily lives, we are only able to see visible light waves. See the below image for reference.

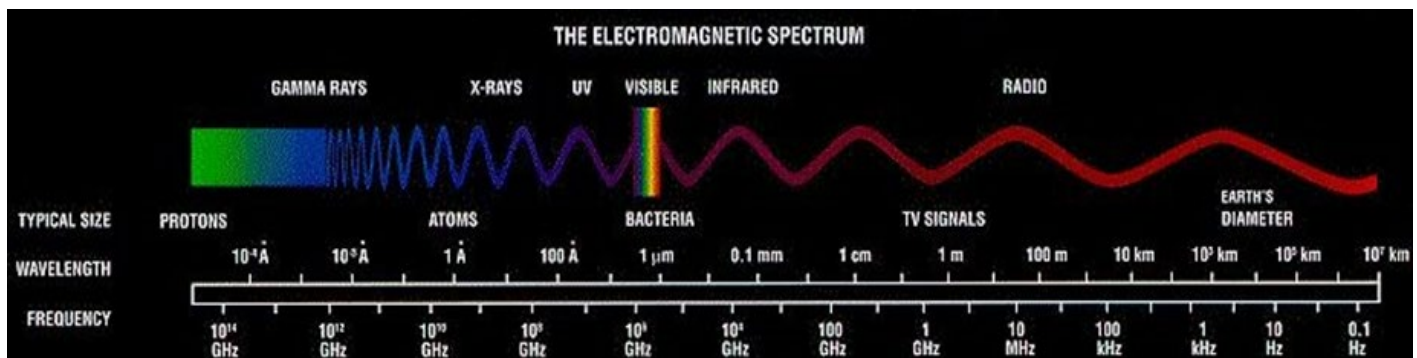


Photo Credit: http://coolcosmos.ipac.caltech.edu/image_galleries/ir_zoo/lessons/background.html

The sun's warmth (infrared radiation) is transferred to surfaces at different rates. For example, on a hot summer day, pavement may be much warmer than a grassy area. This is because the sun's heat energy (infrared radiation) is absorbed more by the pavement than by the grassy area. Many animals use this to their advantage.

Reptiles are known as ectotherms, or cold-blooded. This means that they have trouble regulating their own body temperatures. Therefore, these animals will often time seek out warm areas in which to "bask," or lay out in the sun to help warm their bodies up. You may see them in sunny areas or on a warmed rock.



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Alternatively, on a day that is very hot, they may be harder to find. These animals may burrow down into the ground or may be near water or in areas that are shaded from the sun altogether.

Other animals that we often think of as being warm-blooded, or able to maintain a constant body temperature, are also able to stay warm or cool based on how they interact with infrared radiation. On a hot day, some animals will go into the water, cover themselves with dirt, or stay in the shade in order to stay cool. On a day that is cold, these animals may be seen warming themselves in the sun, staying warm in a nest or burrow, or may have special adaptations that enable them to tolerate the cold.

Vocabulary	
Electromagnetic Spectrum -all of the electromagnetic radiation in the universe	Infrared Radiation -a type of electromagnetic wave, often described as heat
Heat -also known as infrared radiation	Adaptations -specialized characteristics that enable an animal to survive
Bask -to be exposed in the warmth or light	Burrow -a hole or tunnel dug by a small animal, usually for shelter

Student Activity:

Students will explore the Zoo and identify how animals are responding to infrared radiation (heat) throughout the Zoo.



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Student Explore Sheet

Infrared radiation is part of the **electromagnetic spectrum** and is often thought of as heat. Animals exhibit a variety of behaviors as they respond to the weather to stay warm or cool. As you explore the Zoo today, answer the questions below about how various animals respond to different scenarios involving infrared radiation.

Infrared radiation is absorbed at different rates across different materials. Take a look at the African elephant habitat. Based on the current temperature, answer the questions below.

1. Which areas in the habitat do you think would be the warmest?

2. Which areas in the habitat do you think would be the coolest?

3. If one of the elephants were hot, describe how could they use their adaptations and their habitat to cool off.

Reptiles are ectotherms, more commonly known as cold-blooded. This means that they cannot maintain a constant body temperature. Knowing this information, answer the questions below.

1. Pick a reptile from Scaly Slimy Spectacular. Describe why infrared radiation is important to that reptile.
Reptile: _____

Use the space below to describe how this animal depends on infrared radiation.

2. During warmer months, reptiles are able to use the sun to find warmth. As you look at the habitats in Scaly Slimy Spectacular, use the space below to brainstorm what reptiles can do in the winter to stay warm.

Mammals are endotherms (warm-blooded) and reptiles are ectotherms (cold-blooded). Despite their differences, they are able to utilize infrared radiation in similar ways. On the back of this sheet, use the Venn Diagram to brainstorm the similarities and differences of mammals and reptiles, including the ways they are able to use infrared radiation.



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